When revisions in the plans have been made which affect the quantities of structural steel, adjustments in compensation will be made by supplemental agreement.

When the contract includes the item of *Painting of Structural Steel*, all work of painting except for shop painting will be paid as provided in Article 442-15 and payment for shop painting will be included in the contract lump sum price for *Approx. ____ Lbs. Structural Steel*. When the contract excludes the item of Painting of Structural Steel, payment at the contract lump sum price for *Approx. ____ Lbs. Structural Stee*l will be full compensation for both shop and field painting.

*Elastomeric Bearings* will be paid as provided in Article 430-8.

The price and payment will be full compensation for all items required to construct steel structures including, but not limited to, those items contained in Article 440-1.

Payment will be made under:

| Pay Item | Pay Unit |
|---|---|
| Approx. ____ Lbs. Structural Steel | Lump Sum |

# SECTION 442
# PAINTING STEEL STRUCTURES

## 442-1 DESCRIPTION

Paint steel structures and properly prepare metal surfaces; apply, protect and dry paint coatings; protect pedestrian, vehicular, water or other traffic upon or underneath the structure; protect all portions of the structure and adjacent work against disfigurement by splatters, splashes, overspray and smirches of paint or of paint materials; apply paint in the shop and field; and furnish blast cleaning equipment, paint spraying equipment, brushes, rollers, paint cleaning abrasives, cleaning solvents, tools, tackle, scaffolding, labor and any other materials, hand or power tools, inspection equipment and personal protective and safety equipment necessary for the entire work.

## 442-2 MATERIALS

Refer to Division 10.

| Item | Section |
|---|---|
| Abrasive Materials for Blast Cleaning | 1080-13 |
| Paint and Paint Materials | 1080 |

## 442-3 DEFINITIONS

Define “corner” as the intersection of 2 surfaces that are not in the same plane. Define “inaccessible areas” as partially or completely enclosed surfaces, the majority of which are not visible without the use of special devices such as mirrors. Define “sharp edge” as a corner on a steel section that ends in a point or edge and appears able to cut human flesh. Define “stripe coat” as an additional coat of paint applied to the edges, outside corners and areas difficult to coat by spray before or after a full coat is applied to the surface.

## 442-4 SUBMITTALS

Submit quality control plan, work schedule and Department test reports for each batch of paint to be used on the project. Submit product data sheets and MSDS sheets for paint and solvents used. Submit paint repair procedures for review and approval before commencing work.

## 442-5 PROTECTION OF WORK

Protect all parts of the structure against disfigurement by splatters, splashes, overspray and smirches of paint or of paint materials. Assume responsibility for any damage or disfigurement caused by operations to vehicles, persons or property, including plants and animals; and provide protective measures to prevent such damage.

Thoroughly clean and restore any surface or surfaces disfigured by splatter, overspray, splashes, smirches or other defects to its original condition.

Restore any damaged structure or surface to its original condition.

If traffic causes dust considered by the Engineer to be detrimental to the work, sprinkle dust producing areas with water or dust palliative and take any other necessary precautions to prevent the accumulation of dust and dirt on freshly painted surfaces.

## 442-6 QUALITY CONTROL

Both shop and field applicators are required to conduct and document quality control inspection of the painting, including measurements of temperature, dew point, surface profile and paint thickness. Make sure that the paint applicator has the Engineer's pre-approved procedure for repair of all damage and defects. The personnel performing the QC tests for this work shall be Department Certified Coating Level 1 inspectors.

## 442-7 SURFACE PREPARATION

### (A) Blast Cleaning

The blast profile shall be angular and between 1.0 and 3.0 mils when measured on a smooth steel surface. The degree of cleaning required is indicated under the specified paint system unless otherwise noted. Clean weathering steel surfaces to be painted to achieve a SSPC SP-6 finish. Clean surfaces to be metalized to a SSPC-5 finish. SSPC VIS-1 shall be used as a visual standard.

Blast clean by centrifugal or forced air blasters. When using forced air blasters use blast nozzles with a minimum 5/16" orifice and operate at no less than 100 psi when measured with a needle gauge at the nozzle. Use dry blasting for all blast cleaning. Select a size or grade of abrasive that provides the specified finish and profile meeting Article 1080-13.

Perform blast cleaning operations so no damage is done to partially or entirely completed portions of the work

After blasting, brush the surface with clean brushes made of hair, bristle or fiber; blow off with compressed air; or clean by vacuum so any traces of blast products from the surface and any abrasive from pockets and corners are removed. Perform surface inspection once all blast abrasive and dust is removed from surface to be coated.

Use compressed air for nozzle blasting that is free of detrimental amounts of water or oil. Provide adequate separators and traps. Verify cleanliness of air before blasting operations in accordance with ASTM D4285.

Examine the blast cleaned surface for any traces of oil, grease or smudges deposited in the cleaning operations. If present, remove them by an approved method. Ensure the degree of cleanliness and profile are approved before painting.

When blast cleaning structures open to traffic, provide suitable protective enclosures to prevent damage to public and private property. Do not blast directly over traffic without prior approval of the Engineer. If the containment system is not effective in restricting blasting emissions, blasting operations shall cease and deficiencies corrected before work resuming.

Seal all journals, bearings, motors and moving parts against entry of abrasive dust before blast cleaning near bridge machinery.

Prime all blast cleaned surfaces to be painted no later than 8 hours after blast cleaning is complete. Reclean the cleaned surfaces that contain rust or are contaminated with foreign material before painting or bolting to the original surface preparation specifications.

**(B) Hand or Power Tool Cleaning**

Thoroughly remove loose paint, rust, scale, dirt, oil, grease and other detrimental substances by hand cleaning (SSPC SP-2), power tool cleaning (SSPC SP-3) or any combination of these methods. Hand cleaning includes the use of metal brushes, grinders, sanders or any approved combination of these tools. Use bristle or wood fiber brushes to remove loose dust.

## 442-8 PAINT SYSTEMS

Use all paints and solvents for shop and field application that are produced by the same manufacturer.

Use approved/qualified paint products found in Section 1080. Apply the paint system required by the plans and at the film thickness indicated below. Coating thickness in excess of the maximum dry film thickness is acceptable as long as the coating is free of visible defects such as runs, sags, curtains, cracking or lifting.

**TABLE 442-1**
**SYSTEM 1, INORGANIC ZINC (IOZ) PRIMER AND ACRYLIC TOP COATS**

| Coat | Material | Mils Dry/Wet Film Thickness | |
|---|---|---|---|
| | | Min. | Max. |
| Primer | IOZ (See Section 1080-7.) | 3.0 DFT | 5.0 DFT |
| Intermediate | Brown (See Section 1080-11.) | 2.0 DFT | 4.0 DFT |
| Stripe | White (See Section 1080-11.) | 4.0 WFT | 7.0 WFT |
| Topcoat | Gray (See Section 1080-11.) | 3.0 DFT | 5.0 DFT |
| Total | | 8.0 DFT | 14.0 DFT |

Apply System 1 to non-weathering steel surfaces cleaned to an SSPC SP-10 finish. Shop apply the IOZ primer, 2 coats of acrylic paint and one stripe coat of acrylic paint over all structural steel surfaces except as otherwise specified. As an option, acrylic top coats may be applied in the field.

Apply the primer to all bolt holes, plate snipes, shear connectors and all surfaces of the top flange. If bubbling occurs during the application of the first field coat, apply a mist coat of brown paint to prevent further bubbling.

Completely cure the inorganic zinc primer to meet ASTM D4752 with at least a 4 resistance rating before top coating.

Perform 2 random adhesion tests (one test is equal to 3 dollies) per span. Ensure that the adhesion of the zinc primer is no less than 400 psi when tested in accordance with ASTM D4541.

Completely cure the acrylic intermediate and stripe coat to meet ASTM D1640, Section 7.7, ensure that there is no loosening, detachment, wrinkling or other evidence of distortion of the film.

Perform one random cut tape adhesion test per span after the final coat is cured. Ensure that the tape adhesion of the cured system is no less than 3A when tested in accordance with ASTM D3359.

Properly taper and touch up repair areas.

| TABLE 442-2<br>SYSTEM 2, INORGANIC ZINC (IOZ) PRIMER<br>AND COAL TAR EPOXY TOP COATS | | | |
|---|---|---|---|
| **Coat** | **Material** | **Mils Dry/Wet Film Thickness** | |
| | | **Min.** | **Max.** |
| Primer | IOZ (See Section 1080-7.) | 3.0 DFT | 5.0 DFT |
| Intermediate | Red (See Section 1080-8.) | 8.0 DFT | 12.0 DFT |
| Topcoat | Black (See Section 1080-8.) | 8.0 DFT | 12.0 DFT |
| Total | | 19.0 DFT | NA |

Apply System 2 on non-weathering steel surfaces cleaned to an SSPC SP-10 finish. Shop painting consists of painting with a primer and 2 coats of coal tar epoxy paint over all structural steel surfaces except as otherwise specified.

Completely cure the inorganic zinc primer to meet ASTM D4752 with at least a 4 resistance rating before top coating.

Perform 2 random adhesion tests, one test is equal to 3 dollies, per span. Ensure that the adhesion of the zinc primer is at least 400 psi before top coating when tested in accordance with ASTM D4541.

Apply the finish coat when the first coat of coal tar epoxy is still tacky.

| TABLE 442-3<br>SYSTEM 3, ACRYLIC PRIMER AND TOP COATS | | | |
|---|---|---|---|
| **Coat** | **Material** | **Mils Dry/Wet Film Thickness** | |
| | | **Min.** | **Max.** |
| Primer | Brown (See Section 1080-11.) | 2.0 DFT | 4.0 DFT |
| Intermediate | White (See Section 1080-11.) | 2.0 DFT | 4.0 DFT |
| Stripe | Brown (See Section 1080-11.) | 4.0 WFT | 7.0 WFT |
| Topcoat | Green (See Section 1080-11.) | 2.0 DFT | 4.0 DFT |
| Topcoat | Gray (See Section 1080-11.) | 2.0 DFT | 4.0 DFT |
| Total | | 8.0 DFT | 16.0 DFT |

Apply System 3 in the field or shop to non-weathering steel surfaces cleaned to an SSPC SP-6 finish. Painting consists of painting with 2 primer coats, a stripe coat and 2 finish coats over all structural steel surfaces except as otherwise specified.

Provide a curing period for the first primer coat of paint of at least 24 hours. Perform one random cut tape adhesion tests per span after final coat is cured. Ensure that the tape adhesion of the cured system is at least 3A when tested in accordance with ASTM D3359.

Properly taper and touch up repair areas.

| TABLE 442-4<br>SYSTEM 4, ACRYLIC PRIMER AND TOP COATS FOR WEATHERING STEEL | | | |
|---|---|---|---|
| **Coat** | **Material** | **Mils Dry/Wet Film Thickness** | |
| | | **Min.** | **Max.** |
| Primer | Brown (See Section 1080-11.) | 2.0 DFT | 4.0 DFT |
| Intermediate | White (See Section 1080-11.) | 3.0 DFT | 5.0 DFT |
| Stripe | Brown (See Section 1080-11.) | 4.0 WFT | 7.0 WFT |
| Topcoat | Brown (See Section 1080-11.) | 2.0 DFT | 4.0 DFT |
| Total | | 7.0 DFT | 13.0 DFT |

Apply System 4 to weathering steel surfaces cleaned to an SSPC SP-6 finish. Shop painting consists of applying all primer and finish paints at the ends of beams or girders within a distance of 1.5 times the depth of the beam or girder at the bearing except as otherwise specified.

Provide a curing period for the first primer coat of paint of at least 24 hours.

Completely cure the acrylic intermediate and stripe coat to meet ASTM D1640, Section 7.7. Ensure that there is no loosening, detachment, wrinkling or other evidence of distortion of the film.

Perform one random cut tape adhesion test per span after the final coat is cured. Ensure that the tape adhesion of the cured system is at least 3A when tested in accordance with ASTM D3359.

Properly taper and touch up repair areas.

## 442-9 APPLICATION OF PAINT

### (A) General

Unless otherwise permitted, apply all paint by spraying, except apply the stripe coat by brush or roller. The use of a brush or roller is permitted to make minor repairs to the primer.

Make sure that the applicator has a current copy of the paint manufacturer's application instructions, along with MSDS for each paint; and furnish 2 copies to the Engineer. Unless otherwise required herein, apply in accordance with the manufacturer's instructions.

All paint materials shall be tested and approved by the Materials and Tests Unit before application.

Paint in a neat and workmanlike manner. Apply the paint to provide a tight film of the specified thickness, well bonded to the metal or previously applied paint, and free of laps, streaks, sags or other defects.

Make sure each coat of paint is in a proper state of cure or dryness before applying the succeeding coat.

Before successive coating application remove all contaminates, dry spray/overspray, paint splatter and other non-adherent paint shall be removed before applying successive coating layers. When necessary, clean each coat of paint in accordance with Subarticle 442-7(B).

When a stripe coat is required, apply a 2" stripe by brush or roller to all exposed edges of steel before applying the finish coat. Locate the edge or corner in the approximate center of the paint stripe.

### (B) Application Conditions

Unless the paint manufacturer's application instructions are more restrictive, obtain written permission to apply paint if the temperature of the air or metal is not at least 40°F and rising for inorganic zinc primers or 50°F and rising for acrylic paint or coal tar epoxies, when freezing weather is forecast during the drying period, or when the metal is hot enough to cause the paint to blister or produce a porous paint film.

Do not apply paint or perform any surface preparation when the air is misty; in the rain, snow, fog, when wind velocity is continuously greater than 10 mph or when the steel surface temperature is less than 5°F above the dew point. The humidity shall be less than 85% and lower when applying acrylic paints. Use ASTM E337 when performing ambient conditions assessments.

Obtain written permission from the Engineer to apply field coats of paint between November 15 of one year and April 15 of the following year inclusive. Do not apply any coating above or below the manufacturers recommended application temperatures or during a period when an ambient temperature outside the recommended range is predicted during the drying and curing period of the paint.

Harsh environments may necessitate re-cleaning during or between paint applications.

**(C) Adverse Weather**

Obtain written approval to use enclosures during adverse weather conditions. Use enclosures that control atmospheric conditions artificially inside within limits suitable for painting during the painting operation and until the paint is dry/cured or until weather conditions permit its exposure in the open.

**(D) Storage Conditions**

Provide adequate and safe storage for all paint and equipment. Do not expose paint materials to rain, excessive condensation, long periods of direct sunlight or temperatures above 110°F or below 40°F. Follow the manufacturer's storage requirements if more restrictive.

Replace paint damaged by any cause.

**(E) Mixing Paint**

Mix paint in accordance with the manufacturer's instructions and Article 1080-1.

**(F) Thinning**

All paint thinning activities shall have prior approval. The paint products specified in Section 1080 do not require thinning when applied under normal conditions. Obtain written approval for any thinning necessitated by weather conditions or other causes. Only those thinners approved by the paint manufacturer as described in the application instructions are permitted.

**(G) Spray Application**

Use equipment for spray application of paint that is suitable for the intended purpose, capable of properly atomizing the paint, and equipped with suitable pressure regulators and gauges. Use air caps, nozzles and needles recommended by the manufacturer of the equipment for the material being sprayed. Keep the equipment in satisfactory condition to permit proper paint application. In closed or recirculating paint spray systems where gas under pressure is used over the liquid, use an inert gas, such as nitrogen.

Provide and drain periodically during operations, adequately sized traps or separators to remove oil and water from the compressed air. Make sure that the air from the spray gun impinging against the surface shows no water or oil.

Use an agitated spray pot. Adjust the agitator or stirring rod to reach within 2" of the bottom of the spray pot and be in motion at all times during paint application. Provide sufficient motion to keep the paint well mixed.

Apply paint in a uniform layer, with overlapping at the edge of the spray pattern. Adjust the spray pattern so the paint is deposited uniformly.

**(H) Stripe Coat**

When a stripe coat is required, apply a 2" stripe by brush or roller to all exposed edges of steel before applying the finish coat. Locate the edge or corner in the approximate center of the paint stripe. Brush apply stripe coat application on bolts, nuts, welds and other obstructed locations. Roller apply stripe coat only on structural shape edges.

## 442-10 SHOP PAINTING

### (A) General

Shop painting is the painting of structural steel in an enclosed shop or plant before shipment to the site of erection. The work in this section applies to previously uncoated steel and includes the proper preparation of the metal surfaces and the application, protection and cure/drying of coatings. Complete all shop fabrication, including welding and attachment of shear connectors, before painting is started.

### (B) Certification

In order to perform work for the project, all steel fabricators are required to establish proof of their competency and responsibility in accordance with NCDOT's Structural Steel Fabricator Qualification Program, and, where required, provide a shop certification by American Institute Steel Construction (AISC) Sophisticated Paint Endorsement (SPE) or Society of Protective Coatings (SSPC) Qualification Procedure Three (QP3) or approved equivalent when the quantity is greater than 1,500 sf of painted steel.

### (C) Painted Areas

(1) Do not paint the following surfaces:

(a) Bearing assemblies, plates and other galvanized or metallized parts.

(b) Areas where field welding is to be performed.

(c) Outside surfaces of splice plates (Systems 3 and 4 only).

(d) Plate surfaces contacting elastomeric bearing pads.

(e) Contact surfaces with blockouts for bolted connections on curved girder bridges and beam and girder splices (Systems 3 and 4 only). In the areas of these blockouts, extend the finish paint no closer than 2" nor more than 3" from the edges of contact surfaces in bolted connections. Ensure that the primer paint is clearly visible around these areas when the structural steel is assembled. The same offset dimensions are required for finish paint at field welds, measured from the proposed location of the field weld.

(2) Areas where paint is not required and overspray is permitted are shear connectors and the top surface of the top flange.

(3) Clean and paint stiffener clips and other obstructed areas on a best effort basis. Such areas are those that contain enclosed surfaces, the majority of which are not visible.

(4) Apply a stripe coat on all corners and raised welds.

(5) Provide a repair procedure for all damage and defects for approval before painting.

(6) Do not load material for shipment until at least 24 hours after applying the paint and the paint is thoroughly dry.

### (D) Surface Preparation

Prepare surface of steel surfaces in the shop in accordance with Article 442-7. Check abrasives daily for contaminants or as otherwise directed by the Engineer. Verify that abrasive material meets the cleanliness requirements of SSPC AB-1 or SSPC AB-2 depending on the abrasive material used.

The following items are required as a part of preparation and cleaning and shall be done before application of the prime coat:

(1) Corner Condition

Bevel corners to an approximate 1/16" chamfer if the included angle is less than 90 degrees.

(2) Surface Irregularities

Remove slivers, hackles, tears and projection of blast cleaned steel. Restore the profile in areas larger than one square foot.

(3) Weld Spatter

Remove excessive and loose weld spatter. Tightly adherent weld spatter is allowed unless it is sharp. Flatten sharp weld spatter.

(4) Bolts

Shop installed galvanized bolts on which the coating is disturbed or distressed during shop cleaning is of no concern as long as the coating system is applied over them. If necessary, after installation, clean shop installed black bolts in accordance with SSPC SP-1 solvent cleaning. Blast clean or otherwise clean by an approved alternative method the bolts before shop priming.

## 442-11 FIELD PAINTING

### (A) General

Field painting is conducted after erection, or when damage to a shop applied coating system is repaired or when steel is otherwise painted outside an enclosed shop environment.

Do not apply paint over traffic without prior written approval from the Engineer.

Touch-up of shop painted non-weathering steel consists of painting with primer and finish paint over all the previously uncoated exposed metal surfaces. When the repair area exceeds one square foot, clean, prime and topcoat damaged areas in accordance with Subarticle 442-7(A); otherwise, clean, prime and topcoat damaged areas in accordance with Subarticle 442-7(B). For systems with shop applied topcoats, apply an additional field appearance coat of finish paint to the outside surface of all exterior beams on non-weathering steel bridges over highways and navigable waterways.

When an appearance coat of finish paint is required, paint the portion of galvanized high strength bolts on the outside face of exterior beams or girders with primer and appearance coat of the finish paint. Apply the primer to the galvanized high strength bolts by brush, so the primer is not applied to the adjacent finish paint.

At the location of field welds, satisfactorily remove all paint or galvanizing by blast cleaning, hand cleaning or power tool cleaning just before welding. Clean sufficiently to prevent contamination of the weld by the paint.

Final acceptance by the Engineer will be after erection of the structure, when the final coat has been applied, and all repairs effected.

Clean all contaminants such as soil, concrete, weld splatter, grease or any other deleterious material from the steel or shop coated surfaces before any painting operations begin. Harsh environments may necessitate re-cleaning during or between paint applications.

**(B) Certification**

SSPC QP-1 certified contractor shall perform work that is not associated with Hazardous Coating Removal operations.

## 442-12 PREPARATION FOR PAINTING GALVANIZED SURFACES

When painting galvanized surfaces is required in the plans, smooth, clean and prepare in accordance with Section 1080 and this section. Provide shop certification in accordance with Article 442-10 regardless of the quantity of painted steel.

Do not paint portions of galvanized piles encased in concrete below ground.

Smooth high spots and rough edges, such as metal drip lines, of galvanized surfaces in accordance with ASTM D6386. Clean galvanized surfaces to be painted with a 2,500 psi pressure washer. Allow surfaces to dry completely before beginning surface preparation.

Prepare galvanized surfaces to be painted by sweep blasting in accordance with ASTM D6386. Use an abrasive material and technique that roughens the surface while leaving base zinc layers intact. After sweep blasting, blow down blasted surfaces with clean, dry, compressed air free of contamination.

Apply paint to clean, dry surfaces free of visible zinc oxides or zinc hydroxides within 8 hours of surface preparation.

## 442-13 INSPECTION

Only Department Certified Coating Level 1 inspectors shall inspect the field-coating application.

Ensure that the coating applicator maintains a daily quality control record. The information required in the record is listed on Materials and Tests Form M&T-610. Maintain quality control data in a log and format approved by the Engineer. Enter data daily or immediately as coating activities are conducted. Ensure that the applicator's quality control representative signs and dates each entry.

Apply all coatings in accordance with SSPC PA-1. Repair all coating defects or nonconformities in accordance with SSPC PA-1. Make repairs to the topcoat with a uniform gloss and color on visible surfaces. The Engineer makes the final decision concerning uniformity and appearance.

## 442-14 REPAINTING OF EXISTING STEEL STRUCTURES

**(A) Pollution Control**

During field painting operations, use all necessary precautions to prevent dispersion of surface preparation debris, paint or any other material outside the work area due to wind or any other reason.

**(B) Hazardous Paint Removal**

Should the existing paint system include toxic substances such as red lead oxide, which is considered hazardous if improperly removed, furnish a containment and spill control plan for surface preparation and painting operations and await review and approval of said plan before beginning work. This plan shall meet Class 2A in accordance with SSPC Guide 6. This work shall be performed by a SSPC QP-2 certified contractor.

Monitor air quality. Any visible emissions outside the containment structure or air quality monitoring results exceeding the permissible OSHA action level are justification for suspension of the work. Monitor air quality at random locations within one foot to 5 ft from the enclosure in accordance with National Institute of Occupational Safety and Health (NIOSH) Method 7082.

Immediately collect and retain any spilled dust or paint debris in approved containers. If a spill results in soil or water contamination, take all necessary actions to remediate the site to its original state.

**(C) Waste Handling**

Clean and dispose of any incidental material or equipment that is contaminated as the result of work performed.

**(D) Health and Safety Responsibility**

In addition to Article 105-11 and Sections 106 and 107, provide effective engineering and work practice controls to insure adequate protection.

Before beginning work, certify to the Engineer that all personnel involved with lead paint removal operations (including rigging and material handling personnel) are properly trained and understand the applicable parts of EPA, 40 CFR Part 745, OSHA Standards, 29 CFR Part 1910 and 29 CFR Part 1926 including any amendments in force at the time of this contract.

### 442-15 MEASUREMENT AND PAYMENT

When the contract excludes the item of *Painting of Structural Steel*, there will be no direct payment for the work covered by this section.

When the contract includes the item of *Painting of Structural Steel*, all work covered by this section, except for shop painting, will be paid at the contract lump sum price for this item. Payment at the contract lump sum price for *Approximately ____ Pounds Structural Steel* as provided in Article 440-10 will be full compensation for the work of shop painting.

Repair or replacement of paint damaged by any cause will be incidental to the work of this section.

These prices and payments will be full compensation for all items required to paint steel structures including, but not limited to, those items contained in Article 442-1.

*Pollution Control* will be paid as the contract lump sum price.

When provided for in the contract, payment will be made under:

| Pay Item | Pay Unit |
|---|---|
| Painting of Structural Steel | Lump Sum |
| Pollution Control | Lump Sum |

# SECTION 450
# PILES

### 450-1 DESCRIPTION

Furnish and install piles in accordance with the contract and accepted submittals. Provide steel and prestressed concrete piles and composite piles with both concrete and steel sections shown in the plans. Drive and drill in piles and use pile tips and accessories as shown in the plans. Galvanize, restrike, redrive, splice, cut off and build up piles and perform predrilling, spudding and pile driving analyzer testing as necessary or required.

Define “pile embedment” as the required pile embedment in the cap or footing and “pile penetration” as the minimum required pile tip elevation or penetration into natural ground, whichever is deeper. Define “natural ground” as below the ground or mud line before constructing any embankments.

The estimated pile lengths shown in the plans are for bid purposes only. Provide piles of sufficient lengths for the required driving resistance, pile embedment and pile penetration. Determine required pile lengths by performing subsurface investigations, as needed.